

*NOAA  
National Weather Service  
National Centers for Environmental  
Prediction*

*Strategic Plan*

*of the*

*Marine Prediction Center*

*February 13, 2001*

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## EXECUTIVE SUMMARY

The Strategic Plan of the Marine Prediction Center (MPC) provides a framework to lead the National Centers for Environmental Prediction (NCEP) into the 21st century for marine environmental products and services. This plan is the result of a critical examination of current requirements by the marine user community, the National Weather Service (NWS) Modernization and Associated Restructuring (MAR) program plan, evaluation of the current and future state of the science and technology, and professional training issues facing the MPC as it continues to modernize the warning and forecast process to meet future NWS and public needs for the protection of life and property at sea.

The MPC is midst of dramatic transformation. These changes are being reflected in MPC's programs, operational production, and science and technology implementations. Currently providing both alphanumeric and graphical products to support NWS field activities, other National Centers, and the marine end user, MPC has evolved from pen-to-paper graphical product generation, manual scanning, and staging of paper charts, to interactive workstation production and electronic staging for product distribution. The MPC product generation process will provide gridded marine atmospheric and oceanic weather analyses and

forecasts that will be easily incorporated into the Weather Forecast Office (WFO) forecast process.

The incorporation of the software and hardware technology of the Advanced Weather Interactive Processing System (AWIPS), as well as the National Center AWIPS (N-AWIPS) software, will expand MPC's capability to serve as the central and primary source of marine atmospheric oceanic weather analysis and forecast products to the general marine user community. The MPC products and services of the future will enhance traditional analyses and expand to include a new suite of products. The MPC will employ new technologies of software and hardware, implement changes in the science, use new data sets, and incorporate efficiencies of electronic workstations in the production suite.

The challenge to MPC in realizing its vision of product enhancements, new products, and user community outreach is one of resource availability. In a budget climate of governmental belt tightening, the MPC will work to implement improvements in the science, software, and hardware in a way best employing the limited human and monetary resources. Advice from our users will be very important in that decision making.

## 1.0 INTRODUCTION

The Marine Prediction Center plays a key role in advancing the National Weather Service mission of protecting lives and property by extending its watchful eye beyond land boundaries into the oceanic domain. It is inaccurately believed by some that once a storm has moved offshore, weather-related dangers vanish. Of course, this is not the case. For the year 1993, for example, Lloyd's Register of Shipping reported 219 vessels lost -- 28 percent as a result of heavy weather-- along with 504 lives. These losses are not unusual and continue to this day.

This strategic plan outlines what the MPC is doing now and intends to do in the future to meet the ever changing needs of its diverse customer base. To fulfill MPC's vision, this document addresses our plans for enhancements to service and the advances in science and technology to make this happen.

### 1.1 Mission Statement

*The MPC originates and issues marine atmospheric and oceanographic warning, forecast, and analysis products for the north Atlantic and north Pacific as part of the NWS mission of protecting life and property and enhancing economic opportunity.*

As part of its mission, the MPC provides tailored marine forecasts in response to emergency requests by other federal agencies.

The products are issued directly to external marine end users, NWS forecast offices, and other National Oceanic and Atmospheric Administration (NOAA) offices and federal agencies. These products are supported by development, refinement, and implementation of specialized applications and unique numerical weather prediction

techniques.

MPC carries out its mission from the World Weather Building, located in Camp Springs, Maryland, not far from the Nation's capital. MPC's forecast staff of 20 experienced meteorologists is assisted by a small technical development branch and small administrative staff. With 25 people, the MPC is the smallest center of the National Centers for Environmental Prediction.

### 1.2 Vision Statement

*The MPC strives to be a civilian Center of Excellence for marine weather forecasting, resulting in increased safety to mariners and their vessels as they transit the world's bodies of water.*

Future activities will prepare the Center for its role as the central and primary source of marine atmospheric oceanic weather analysis and forecast products to NWS field activities, other national centers, and the marine user community.



*The World Weather Building,  
Camp Springs, Maryland:  
home of the Marine Prediction Center*

### 1.3 MPC's Customers

Maritime operations have been an importance component of the Nation's strength since its founding. From the point of view of commerce and transportation, the United States is the world's largest trading nation, accounting for nearly 20 percent of world trade. Over 90 percent of the goods entering this country come through U.S. port facilities. A chain of economic activity emanates from these maritime-based operations. The result is a contribution of \$78.6 billion to the gross domestic product and the generation of nearly 16 million jobs.

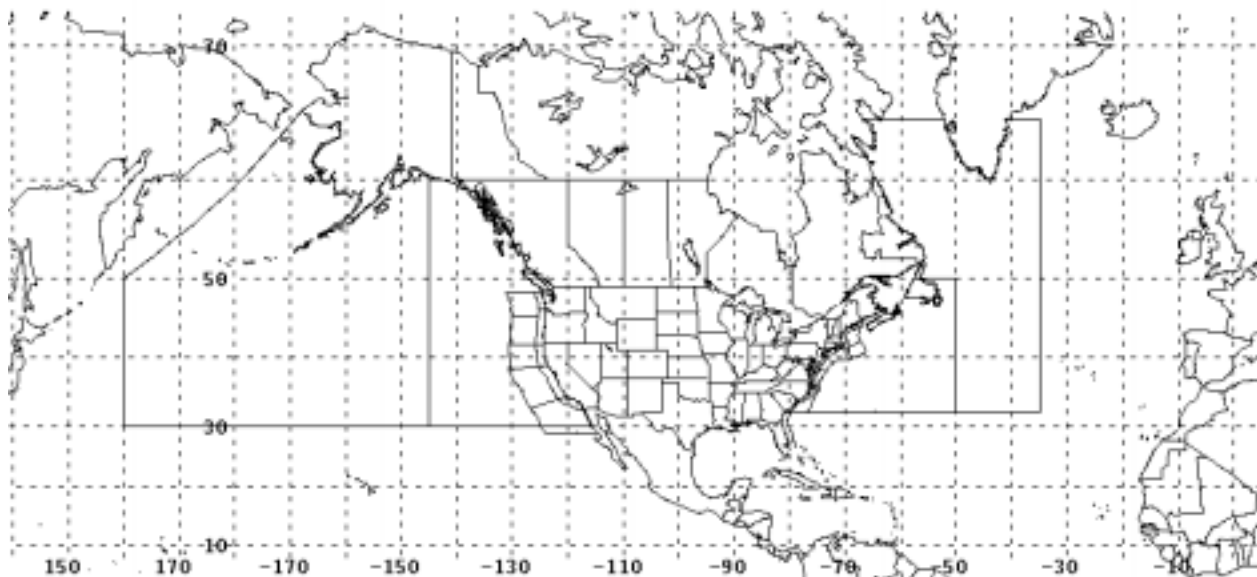
Food drawn from the ocean also plays a significant role in the U.S. economy. The value of the U.S. marine catch is \$3.5 billion per year. Annual catches of 5 million tons make the U.S. the fifth largest fishing nation.

The U.S. offshore oil and gas industry has been in operation since 1947 and currently employs 85 thousand Americans. The significance of this marine industry to the economy can be gauged by the fact the federal government collects nearly \$4 billion annually

in bonuses, rents, and royalties from oil and gas producing leases.

Recreational boating is enjoyed by over 77 million Americans in over 16 million boats. This industry annually generates nearly \$18 billion in sales of boats and related material.

These groups, however, are but a portion of the broad spectrum of MPC customers, a number of which are depicted in photographs throughout this plan. In addition to the customers mentioned above, academic institutions rely use MPC products as training materials for classes in maritime meteorology, safety, and heavy weather avoidance. Maritime publishing companies write articles on MPC products to enhance the safety and efficiency of navigation. Private weather companies employ MPC products as a starting point and second opinion in their tailoring of specific products for specific customers, such as in their optimal routing of ships. Various government agencies, such as the NOAA Corps and U.S. Coast Guard, apply MPC products in their daily operations of vessels in the MPC's geographic areas of responsibility. And MPC partners with NWS field offices having marine responsibilities to provide a



*MPC's areas of responsibility*

seamless product suite for marine customers from shore to shore.

The MPC is entrusted with providing the weather warnings and forecasts contributing to the safety of the people, as well as their vessels and cargoes, operating in these various maritime sectors. This is a huge responsibility the MPC staff takes very seriously and upon which they are highly focused.

#### 1.4 Obligations and Requirements

The U.S. is a signatory of the international Safety of Life at Sea (SOLAS) agreement (November 1974), which traces its origin to the sinking of the RMS Titanic in 1912. The products and services provided by the MPC satisfy U.S. obligations under this agreement and other national and international commitments to ensure safety of life and property at sea (14 US Code 147 (1949) and Executive Order 12234, September 30, 1980).

The MPC has been assigned NWS warning and forecast responsibilities for the conterminous U.S. offshore waters north of 31 N latitude in the Atlantic and 29 N latitude in the Pacific. These responsibilities were envisioned in the Strategic Plan for the Modernization and Associated Restructuring of the National Weather Service, March 1989 (Amended) and are now codified in Weather Service Operations Manual Chapter D-51, Appendix B “Modernized NWS Coastal Marine Forecasts – Areas of Responsibilities”.

MPC’s regional products provide the NWS field offices with marine information in the U.S. coastal waters. These specialized analyses, forecasts, and narrative interpretations by MPC’s marine specialists are used as a starting point or second opinion by the field offices and are important tools ensuring the seamless integration of field office and MPC products. (Plan for the

Reorganization of the National Meteorological Center, Chapter 7 “Marine Prediction Center”)

#### 1.5 Operational Overview

The MPC issues both text and graphical products in the form of warnings, analyses, and forecasts providing for direct input and application to coastal ecosystem health, marine safety, marine navigation, fisheries, recreational boating, climate, and other national and international programs. Products are made available to all users in various forms to ensure easy access by the marine user community and the public.

The MPC analysis, forecast, and warning products cover the North Pacific Ocean and North Atlantic Ocean on three scales: ocean basin (high seas), regional, and offshore. These areas are included in the figure at the bottom of the previous page. Ocean high seas graphical products cover the oceanic basins of the Atlantic and Pacific north of about 20 degrees north latitude. Regional graphics and text products cover adjacent waters of the U.S. from the coast to about 1000 nm out. Offshore text products cover the east and west coasts of the U.S. from about 25 to 500 nm out with more detailed, mesoscale information.

The geographic areas of responsibility



*Product preparation at the MPC*

The MPC coordinates closely with WFOs having coastal marine warning responsibilities, as well as with various Navy meteorology and oceanography (METOC) centers.

The MPC traces its origin back to an NWS Restructuring Planning Committee recommendation of 1978. In that year, the NWS Director formed a committee consisting of the NWS Deputy Director, representatives of each NWS region, and five additional headquarters staff members to make recommendations for the NWS of the 1990s. The restructuring would take advantage of changes in science, technology, new systems, and other efficiencies of operation. Among the committee's recommendations was the transfer of the high seas forecast responsibility from the various NWS field offices to NCEP, which was then called the National Meteorological Center (NMC).

Atlantic radiofacsimile broadcast was undertaken by SMS in March 1993, having been transferred from the Boston WSFO. Shortly thereafter, in April 1993, SMS was reorganized as the Marine Forecast Branch (MFB), a reflection of expanded marine analysis, forecast, and warning responsibility, as well as its Atlantic and Pacific radiofacsimile role. In January 1994, a global real-time marine observation quality control function was added and the Regional Desk established. In February 1994 MFB expanded and enhanced both the Atlantic and Pacific radiofacsimile broadcasts. In a major restructuring of NMC into NCEP, the MPC was formed on October 1, 1995, with two branches -- MFB and the Marine Applications Branch (MAB). On June 10, 1997, under another implementation of the NWS MAR plan, the MPC subsumed offshore warning and forecast responsibility for the Atlantic and Pacific from four coastal NWS WFOs. Also on this date, the Regional Desk function was divided, dedicating one desk to cover the Atlantic and the other to cover the Pacific regional areas.



## 4

Two fundamental types of products are provided by the MPC -- analyses and forecasts. Analyses determine current conditions of the marine environment, both atmospheric and oceanographic. Forecasts of marine conditions are issued to provide safety information for the protection of life and property and the enhancement of the national economy.

## 2.1 MPC Operations

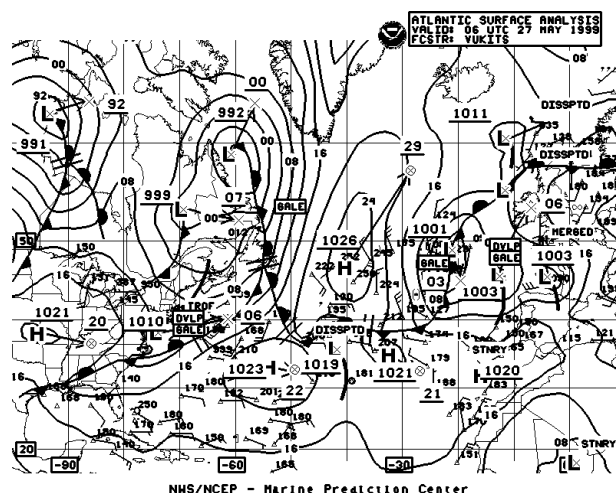
The MPC's MFB, operating 24 hours per day, 7 days per week, prepares and disseminates graphical, and narrative products on a fixed, recurring schedule. MFB also provides special marine forecasts and other services in response to emergency situations as requested by NWS Regional Offices, the Federal Emergency Management Agency, U.S. Coast Guard (USCG) Search and Rescue (SAR), NOAA Hazardous Materials Response and Assessment Division (HAZMAT), among others.

MFB forecasters use model products from NCEP, the European Centre for Medium-range Weather Forecasts, the Meteorological Office of the United Kingdom, the Canadian Meteorological Center, and the U.S. Navy's Fleet Numerical Meteorology and Oceanography Center to generate forecasts and warnings for mariners. Products are issued to the end users in text, voice, and graphical format via the USCG, NWS Automation of Field Operations and Services (AFOS), AWIPS, Family of Services (FOS), Digital Facsimile (DIFAX), INMARSAT, and the Internet at [www.mpc.ncep.noaa.gov](http://www.mpc.ncep.noaa.gov). MFB meteorologists also quality control the global marine observations from ships, fixed and drifting buoys, and the coastal marine automated network.

The MPC's MAB takes the lead in developing new and improved techniques for

better warning, analysis, and forecast products and services for the coastal, offshore, and high seas areas of interest. These improved products and services are implemented by the MFB and NWS coastal field offices, as appropriate. MAB staff work closely with NCEP Central Operations (NCO) and the Environmental Modeling Center (EMC), NOAA's other numerical modeling and research labs (such as Pacific Marine Environmental Laboratory), and the U.S. Navy. This branch provides the scientific expertise necessary to ensure user needs, including those identified by WFOs and the public, are developed and implemented.

### 2.1.1 Analysis Products



*MPC surface analysis for the north Atlantic*

The marine meteorological analysis charts include weather systems (high and low pressure systems with 24-hour forecast positions and meteorological fronts), wind speed, and wind direction. The data that form the basis for these analyses come from satellites, ships, buoys, and other NCEP surface weather analyses.

The oceanographic analysis charts include analyses of large-scale significant wave height and direction and may



include important mesoscale meteorological features. These analyses are based on satellite, ship, and buoy observations.

Products are:

*Meteorological (ocean basin):* Charts that cover the Atlantic and Pacific ocean basins and consist of large scale analyses of weather systems (fronts, low and high pressure systems with forecast positions at 24 hours indicated), wind speed, and wind direction.

*Oceanographic (ocean basin):* Charts cover the Atlantic and Pacific Ocean basins, including the Gulf of Mexico, part of the Caribbean, and consist of large-scale analyses of significant wave heights and primary swell directions.

*Regional:* Charts for waters adjacent to the U.S. consisting of analyses and

forecasts of wind, sea height, ice accretion, fogbound regions, and weather systems (such as high and low pressure systems, tropical systems, and meteorological fronts).

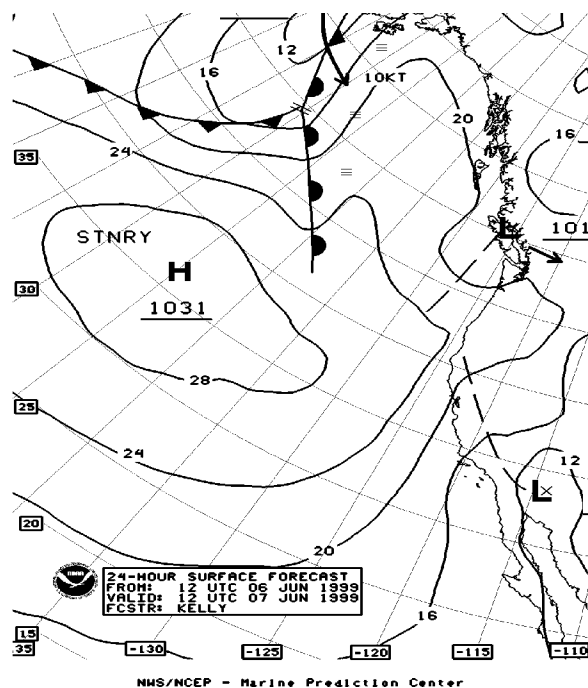
*Text Warnings and Forecasts:* Marine Interpretation Message (MIM) text products in alphanumeric format for both the east and west coasts of the U.S., which contain a synopsis of the existing environmental conditions including gales, storms, tropical storms, and hurricanes, as appropriate.

### 2.1.2 Forecast and Warning Products

Forecast and warning products issued by the MPC are based on the judgment of a team of forecasters using data from satellites and other observations, as well as the output from complex computer models from a number of the world's weather centers. Product improvements and enhancements to services will accrue with the timely availability, integration, and real-time use of remotely sensed data, improvement of the sophistication of workstation product generation, and better understanding of the science.

High seas forecast charts depict expected surface weather patterns at both 48 and 96 hours for the north Atlantic and north Pacific ocean basins north of about 20 degrees north latitude. Each of these charts shows the location of gales, storms, and tropical systems with expected movement and location out to 120 hours. (See accompanying figures.) The charts are for use directly by the marine end user.

High seas text alphanumeric warnings are made out to 36 hours. They cover large portions of the north Atlantic and north Pacific ocean as required under the



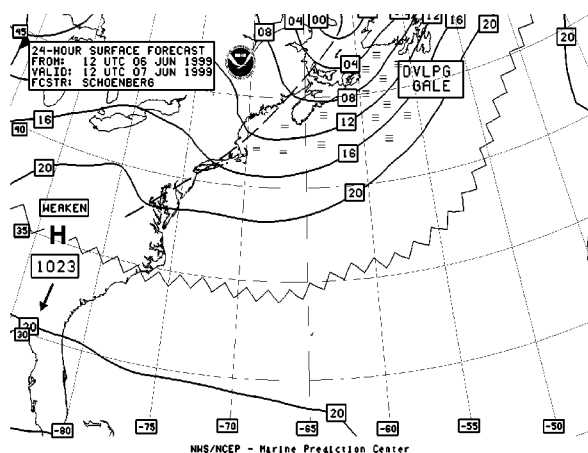
*MPC 24-hour eastern  
north Pacific regional surface forecast*

international SOLAS convention.

As issued by the MPC, oceanographic (specifically sea state) forecast products are largely based on computer-generated output from a wide variety of oceanographic models. The Center also provides specialized products and services for high seas, offshore, and coastal marine applications, as required by other governmental agencies in special circumstances.

Regional forecast charts (as illustrated by the two accompanying figures) are for use by NWS field offices and for distribution directly to marine end users. These graphical charts show projected environmental conditions out to 24 hours and are accompanied by MIMs in narrative format. These charts display various meteorological parameters.

Detailed offshore text forecasts are made to 36 hours for the U.S. west coast and to 48 hours for the east coast. These bulletins contain a synopsis of the existing warnings and environmental conditions, describe locations of gales and storms, and provide a general synoptic outlook of conditions along with associated winds and expected warnings to 120 hours.



*MPC 24-hour western north Atlantic regional surface forecast*

### 2.1.3 The MPC Forecast Process

The success of the MPC resides in the talents of its forecasters, who carry out the forecast process in preparing MPC products and services. Fundamental skills of the forecast staff include:

- scientific knowledge of atmospheric processes.
- knowledge of atmospheric and oceanographic long-term model performance.
- capability to critically analyze and understand available real-time atmospheric and oceanographic information.
- capability to interpret real-time model guidance.
- experience in marine forecasting to include understanding customer requirements and providing quality products in a deadline-oriented environment.

N-AWIPS allows forecasters to view model output, satellite and other observational data, previous MPC graphical products, and text products. N-AWIPS is also used to generate graphical products by modifying graphical versions of model forecasts. This is the preferred mode of operation as long as the model forecast is reasonable. Forecasters also have the option of preparing the graphical forecast product by starting with a blank chart. Text products are prepared using a word processor on a PC.

The process steps are:

- Assessment of observational quality and ensuring the observations are



### *Our customers -- commercial shipping*

consistent with the forecaster's understanding of the current and past state of the atmosphere and sea surface.

- Review and evaluation of numerical model output, leading to a preliminary decision on the expected course of meteorological events.
- Coordination with other MPC forecasters.
- Coordination with other national centers (such as the Hydrometeorological Prediction Center), WFOs, and U.S. Navy, as conditions require.
- Generation and dissemination of analysis, forecast, and warning products.
- Monitoring of the timely receipt of products by the customers.

#### **2.1.4 Areas of Excellence**

As experts in marine environmental processes and their prediction, MPC staff are frequently called upon to provide training to other forecasters and students of marine meteorology. For example, MPC forecasters take part in teaching opportunities provided by such academic institutions as the Sea Education Association, Woods Hole, Massachusetts. In addition they provide instruction on operational marine meteorology to other NWS meteorologists under such programs as the marine seminars and workshops sponsored by the NWS

Western Region and to mariners at the annual Safety-at-Sea Seminars held at the U.S. Naval Academy. They are regularly invited to make technical presentations to captains and mates attending the Maritime Institute of Technology & Graduate Studies (MITAGS), Linthicum Heights, Maryland, thus ensuring these users fully understand and accurately interpret MPC products as they seek to stay out of harm's way. MPC will work to expand the scope of these training activities.

#### **2.1.5 Implementation Strategy**

MPC's strategy for the implementation of improved products and services will be the result of a proactive interaction with NWS field offices, the marine user community, numerical modelers, and the academic and research communities. The MPC, through its MAB, will work closely with NCO's Computing Development Branch (CDB) to ensure timely integration of both software and hardware capabilities and requirements.

#### **2.2 Dissemination and Communication**

The MPC uses a number of disparate processes, equipment, communication systems, and linkages for the generation and distribution of alphanumeric, voice, and graphical products.

Currently, ocean basin graphical products, both analyses and forecasts, are generated at MPC using interactive workstations and then transmitted into a store-and-forward system at the NWS Office of Systems Operations (OSO). OSO makes these products available to the USCG, which distributes them by high frequency (HF) radiofacsimile. OSO also makes MPC products via the Internet, DIFAX, and FOS.

Regional graphical products are also generated on an interactive workstation and transmitted to OSO for distribution as described above. Offshore and some regional graphical products are distributed to NWS field offices by AFOS and AWIPS and non-NWS users by FOS.

MPC alphanumeric High Seas Bulletins (warnings and forecasts) and MIMs are transmitted to OSO. From OSO, products are distributed to users via the AFOS, AWIPS, FOS, USCG, and COMSAT for satellite broadcast over the international SAFETYNET system. In addition, every 6 hours the National Bureau of Standards, Boulder, CO, transmits a recorded voice telephone version of MPC's high seas forecasts for both the Atlantic and Pacific. The condensed messages contain initial conditions and a 24-hour forecast.

## **2.3 Coordination**

Coordination is conducted with the Tropical Prediction Center (TPC), the Central Pacific Hurricane Center, and the Joint Typhoon Warning Center (JTWC) when significant tropical systems are forecast to be in proximity of MPC's area of responsibility or when forecast responsibility is transferred to

the MPC as a result of a system becoming extratropical. Coordination is regularly conducted with coastal WFOs whenever the offshore forecast of environmental conditions warrant issuance of wind/wave warning statements.

Coordination between NCEP service centers such as the TPC will continue to evolve. As the service centers issue new products and grids, the need for coordination between the MPC and other centers will increase. Initially, coordination with centers and certain field offices outside of Washington, D.C., will continue by telephone, but with increasing frequency. At some point, more formal coordination will be required, possibly by video-teleconferencing. AWIPS will become the mechanism for exchanging data sets and information prior to coordination as the technology improves.

Field forecasters with marine responsibilities are encouraged to contact the MPC forecasters to discuss any issues regarding MPC forecasts. The MPC will initiate coordination functions, as appropriate and necessary, with Navy METOC and other International centers to ensure consistency in marine warnings and forecasts.

## **2.4 MPC Goals**

MPC has five major goals. The achievement of these goals will enhance safety at sea for mariners and will result in efficient use of scarce resources. The goals can be summarized as follows:

1. To be recognized as the civilian center of excellence for marine weather forecasting and an advocate for maritime safety through better understanding and awareness of the weather by the marine community.



*Our customers -- the fishing community*

2. To become the central and primary source of operational marine weather analysis and forecast products to NWS field activities, other national centers, and the marine user community.

3. To provide value-added gridded marine atmospheric and oceanographic forecasts to field WFOs and other users.

4. To fulfill new customer requirements by developing implementation strategies to meet these future needs.

5. To undertake activities to enhance our use of advancing science and technology. These improvements will be communicated to our customers, so that they are better able to specify what their requirements of MPC are.

## **2.5 Possible New Products and Services**



*Our customers –maritime recreation*

New products, enhancement of existing products, and expansion of services flow from the validated needs of the marine user community. Support of the WFOs in the coastal zone to help increase consistency and reduce seams in products between areas of responsibility by providing a first guess or second opinion will be an important component.

New products will flow to customers in the high-seas, offshore, and coastal zones with the operational implementation of the Coastal Ocean Forecast System (COFS) at NCEP, gridded output of graphical products, and the use of ensemble techniques. Potential new products include:

Coastal ocean current speed and direction.

Ocean surface temperature analysis.

Graphical, ensemble-based display of storm track forecast position out to 10 days.

Graphical display of 24-hour forecasts of Gulf Stream thermal and position information.

Surface ocean basin weather analyses every 6 hours.

Sea-state analyses every 24 hours.

Regional products:

- augmentation of current wave analyses with wind analyses every 3 hours or more frequently as required.
- guidance to East Coast weather forecast offices on coastal water attributes, including currents, sea surface

temperature (SST), and atmospheric effects on tides based on COFS.

- expansion of this program to support West Coast offices.

### **2.5.1 Product Improvement Goals**

In addition to the implementation of the new products and services listed above, the MPC has set the following goals for improvement. These goals are reflective both of user needs and anticipated capabilities in the AWIPS era.

Wind warnings: predicting the onset and cessation of criteria-level thresholds (for gales and storms) with 3-hour accuracy during the first 48 hours, 6-hour accuracy during the 48-72-hour time frame, and 12-hour accuracy beyond 72 hours.

General forecasts of sensible weather: predicting convection, fog, and freezing spray with the same time accuracies as those for wind/wave warnings and establishing spatial goals by working with the user communities.

Significant wave height (SWH): predicting SWH in the 0-5-m range with 0.5-m accuracy during the first 36 hours and 1.0-m accuracy for 36-72 hours; predicting SWH greater than 5 m with 1-m accuracy during the first 36 hours and 1.5-m accuracy for 36-72 hours.

## **2.6 Customer Service**

MPC will employ methods, strategies, and activities that cultivate and foster a sense of user ownership of its products and services by expanding and enhancing outreach activities with the marine user community and cultivating stronger constituent interactions.

### **2.6.1 Customer Outreach Activities**

It is important that MPC staff work directly with and solicit input from the marine user community in the development and enhancement of observational data, products, and services. This direct interaction includes other NCEP Centers, NWS WFOs, various Navy METOC centers and the JTWC, research and teaching institutions such as MITAGS, the Sea Education Association, and the US Naval Academy, US Coast Guard SAR Auxiliary Power Squadrons, sport fishery organizations such as Virginia Bluewater Gamefish Association, commercial interests, and the general public.

In an effort to foster better understanding of the availability and use of MPC products and services, a number of user forums will be sponsored by the MPC. These



*Our customers -- education  
(Sailing School Vessel Corwith Cramer  
of the Sea Education Association)*

hands-on, in-depth, 2-day workshops will be designed to familiarize users with how to receive, use, and interpret NWS products, especially those provided by the MPC, for both U.S. East and West Coasts.

MPC will also offer 1-day user conferences to provide less formal, direct feedback on existing MPC products and services and to identify new user requirements. In addition, the conference will give MPC the opportunity to present new ideas, future plans, and advances in the science. MPC staff will work closely with the appropriate WFO Warning Coordination Meteorologists and Port Meteorological Officers in the planning and operation of the conferences.

The MPC will actively participate in meetings, boating and sailing shows, conferences, and other recreational meetings that are sponsored by others to focus the public's attention on the value of NWS products and services in safety-of-life-at-sea issues.

### **3.0 SCIENCE**

The MPC will continue to move toward the development and implementation of scientific techniques that will enhance its products and services.

#### **3.1 Scientific Basis for MPC Products**

The amount of science that forecasters are able to use to produce MPC products is limited primarily by the level of technology in place (equipment and applications software), data availability, model output availability, and production schedule. The implementation of electronic workstations, wider availability of disparate data sets, and near-real-time connectivity to numerical model output will

allow forecasters to integrate more science into their products.

There will be greater reliance on utilization of ensemble forecast techniques. Model output from COFS surface current and SST products will be incorporated into the analysis and forecast process.

Activities will be centered on development and implementation of hardware and applications software that will allow MFB forecasters to generate analysis and forecast products from electronic workstations more efficiently. MPC will work closely with NCO's CDB to define requirements and cooperate with programmers of applications software. MAB personnel will validate completed software before operational implementation.

#### **3.2 Research**

In association with other NCEP



*Our customers – mineral exploration*

centers, the NWS Office of Meteorology, and other NOAA and academic research institutions, the MAB will develop new products, processing techniques, data integration and display utilization, and product verification and validation procedures and methodologies.

MAB personnel will develop diagnostics enhancing understanding of model performance and atmospheric behavior. This includes development of statistical measures which will assist MFB forecasters to utilize various model output better.

MAB personnel will also be actively involved in applied research activities that are directed towards a better understanding of atmospheric and oceanic environmental processes. Many of these activities will jointly involve forecasters in the MFB, and results will be published and presented in appropriate venues.

### **3.3 Transition to Gridded Products**

As AWIPS capabilities are delivered



*Our customers – NWS forecast offices with marine responsibilities*

throughout the NWS, there will be a corresponding transition to gridded products. Necessary AWIPS development to support this transition within the MPC will be supported by NCO's CDB. The MPC, working with other NCEP centers, will coordinate with the NCO on the development of software to deliver gridded forecast products to the field forecast offices.

### **3.4 Education, Training, and Professional Development**

The MAB will work with MFB forecasters to ensure all forecasters are familiar with the new technologies and methodologies being developed and evaluated. The MAB will prepare the necessary documentation and work with forecasters of the MFB and with model development staff of EMC's Ocean Modeling Branch (OMB) to ensure adequate training for all meteorologists. This includes MAB personnel standing shifts within the MFB as necessary.

The MPC will train with TPC's hurricane and marine forecasters to ensure coordination and back-up processes operate smoothly during critical weather situations. The MPC forecasters will train at the TPC in order to become more familiar with a broader set of products and forecast methods. A minimum of one forecaster per year will spend 1 to 2 weeks at the TPC.

The MPC will also train with various Navy METOC centers. One forecaster per year will spend one week in a cross-training program at a Navy METOC center to become more familiar with a broader set of Navy products and forecast methods, foster Navy/NOAA coordination, and ensure consistency in Navy/MPC marine analysis, forecasts, and warnings.



All MPC forecasters will also participate in other NWS training courses (WSR-88D and appropriate COMET modules, for example.)

### **3.5 Metrics**

During 1998 the MPC issued 3694 marine warnings (storm, gale, tropical, and Gulf Stream North Wall events) for its North Atlantic oceanic area and 5151 warnings for the North Pacific oceanic areas of responsibility. There were 984 storm warnings issued for the Atlantic and 1367 for the Pacific. In addition for 1998, the MPC distributed over 33,000 graphics charts of analyses and forecasts for both oceanic areas via marine radiofacsimile.

The MPC, working with EMC's OMB and NCO's CDB, will develop new methodologies and techniques to measure and evaluate the accuracy and effectiveness of its product line. The goal will be to assess current capabilities and to better understand model output to improve future products. Techniques developed will be both subjective and quantitative. MPC will provide statistical analysis feedback to modelers on their forecasts products where such measures can be made.

Additionally, the MPC will work closely with other centers and NWS WFOs on the development and implementation of AWIPS-era forecast verification techniques. These techniques will provide the necessary metrics and feedback for MFB meteorologists to refine and optimize their basic product suite and forecast techniques.

## **4.0 TECHNOLOGY**

The MPC will continue to transition its

forecast processes, both for data display and product generation, to modernized computer workstations and communications systems as they are deployed.

### **4.1 N-AWIPS**

The MPC will use N-AWIPS as its basic data display and graphical product generation platform until the N-AWIPS functionalities have been incorporated into AWIPS. During this transition period, MPC staff will work closely with the CDB, which is responsible for both N-AWIPS enhancements and the integration of N-AWIPS into AWIPS, to ensure MPC's graphical product suite can be prepared in an increasingly efficient and ergonomic way.

The MPC will utilize forthcoming gridded data capabilities of N-AWIPS to test the efficacy of the production and use of gridded ocean wave analysis and forecast products. This will allow the MPC to position itself for rapid product implementation once final capabilities for creating and transmitting gridded analysis and forecast products exist within AWIPS.

### **4.2 AWIPS**

Staff of the MAB will work closely



*Our customers -- other government agencies*

with the NCEP AWIPS Requirements Team, the AWIPS Program Office, and the Forecast Systems Laboratory to ensure its requirements for data display and product generation are incorporated into AWIPS.

As AWIPS capabilities grow, the MPC will migrate its operations in stages from N-AWIPS to AWIPS. We anticipate text product generation will be migrated from networked personal computers to AWIPS first. Then, as NCEP-specific extensions are added to AWIPS, the basic display of data will be migrated to AWIPS. Finally, once full graphical product generation and transmission capabilities have been incorporated into AWIPS, the MPC will migrate its production of graphical products to AWIPS.

The MPC is midst of a dramatic transformation. These changes are and will continue to be reflected in MPC's operational production, outreach programs, and application of scientific and technological advances. MPC's strives to be the civilian Center of Excellence for marine weather forecasting, resulting in increased safety to mariners and their vessels as they transit the world's bodies of water. This vision will be achieved through the extensive efforts of a dedicated and talented staff interacting with supportive customers with very high expectations, a scientific community rapidly advancing the state of the art, and a technological community leading the information revolution.

## **5.0 CONCLUDING REMARKS**

## Appendix. **ACRONYMS**

AFOS	Automation of Field Operations and Services
AWIPS	Advanced Weather Interactive Processing Systems
CDB	Computing Development Branch (of NCEP/NCO)
COFS	Coastal Ocean Forecast System
DIFAX	Digital Facsimile
EMC	Environmental Modeling Center (of NCEP)
FOS	Family of Services
HAZMAT	Hazardous Materials Response and Assessment Division (of NOAA)
HF	High Frequency
JTWC	Joint Typhoon Warning Center
MAB	Marine Applications Branch (of NCEP/MPC)
MAR	Modernization and Associated Restructuring (of the NWS)
METOC	Meteorology and Oceanography
MFB	Marine Forecast Branch (of NCEP/MPC)
MIM	Marine Interpretation Message
MITAGS	Marine Institute of Technology and Graduate Studies
MPC	Marine Prediction Center (of NCEP)
N-AWIPS	National Centers AWIPS
NCEP	National Centers for Environmental Prediction
NCO	NCEP Central Operations
NMC	National Meteorological Center
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
OMB	Ocean Modeling Branch (of NCEP/EMC)
OSO	Office of Systems Operations (of the NWS)
SAR	Search and Rescue
SMS	Satellite and Marine Section (of NMC)
SOLAS	Safety of Life at Sea
SST	Sea Surface Temperature
SWH	Significant Wave Height
TPC	Tropical Prediction Center (of NCEP)
USCG	United States Coast Guard
WFO	Weather Forecast Office
WSFO	Weather Service Forecast Office